WBS 5 - Forward Pixels

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Doe/NSF Review

May 19, 1998

Outline

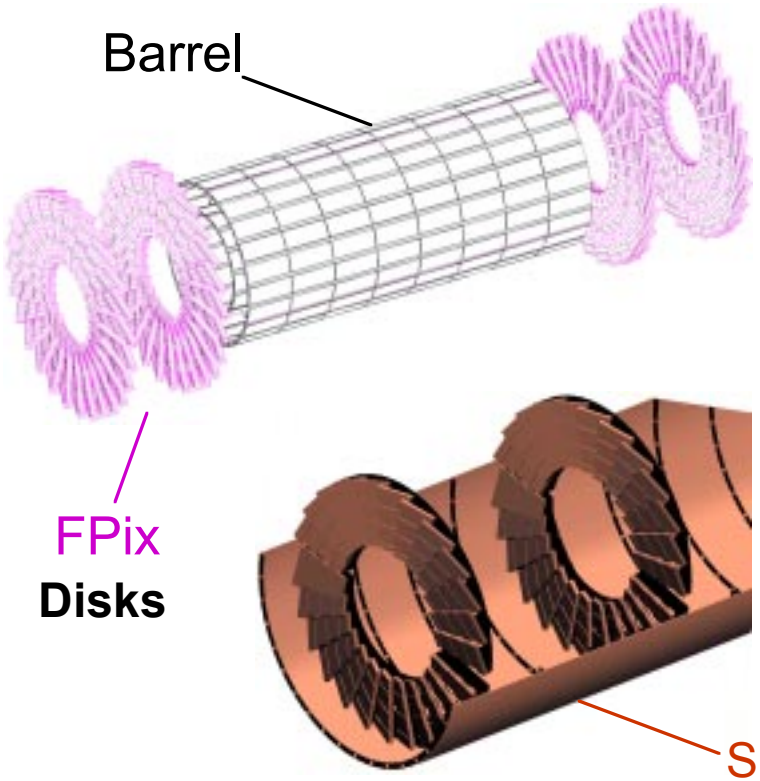
- System Overview
- Cost Estimate
- Organization, L2, L3
- Status and Progress
- Scope and Contingency Since Last Review
- WBS, Milestones, and Schedule
- Commitments and Resource Profiles
- Statement of Work
- Committee Concerns and Corrective Actions
- Summary and Conclusions

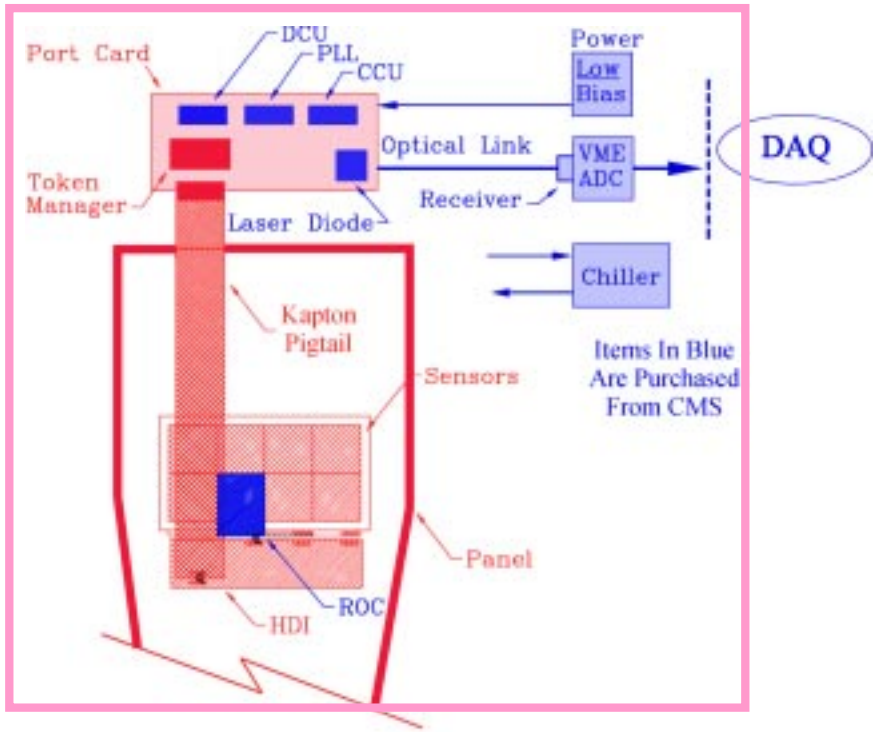
System Overview

FPix: US delivers 4 'disks' ("stand alone" system).

(Sensors, HDI, port card, optical link, ADCs, cables, power supplies, mechanical support, and cooling.

No changes in scope since last year.

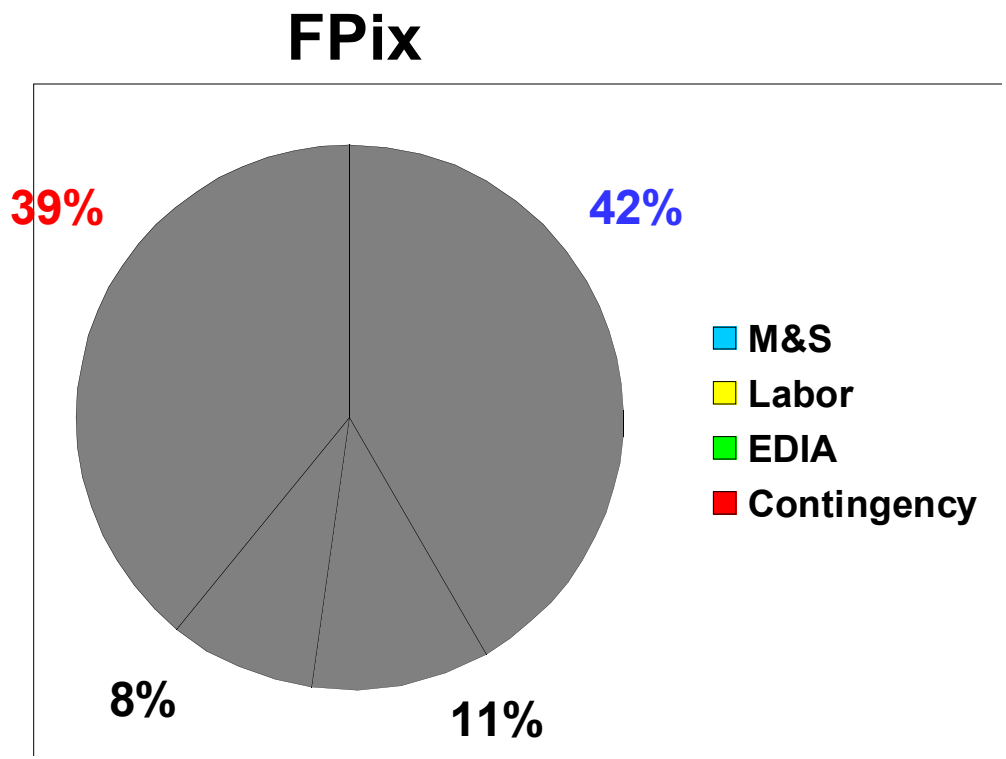




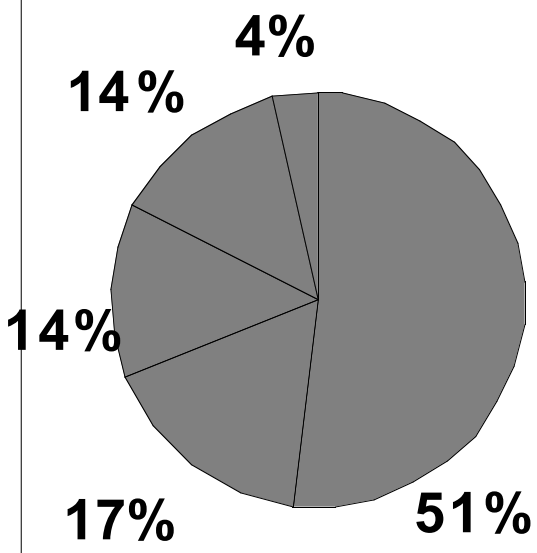
Cost Estimate

A new "bottom up" baseline has been reviewed by the PMG.

The largest cost driver for the FPix is the M&S purchase.

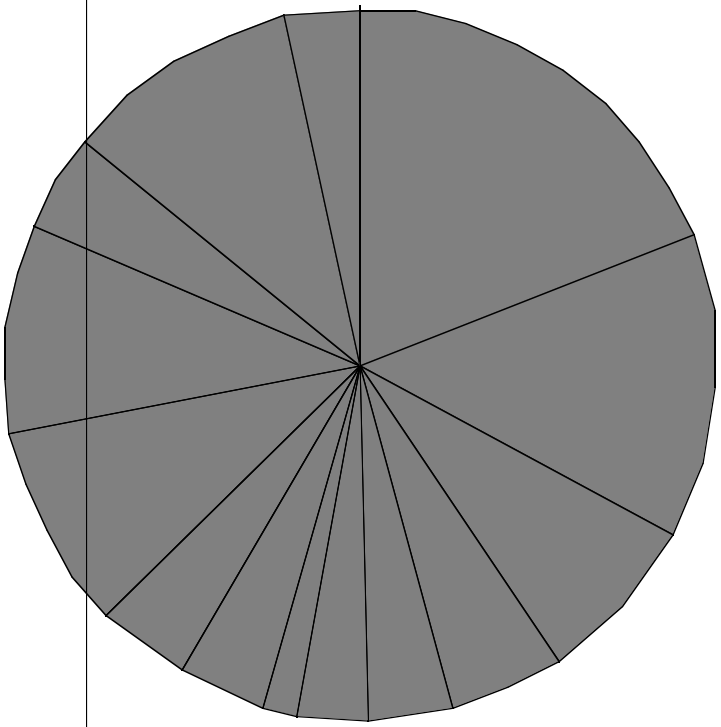


FPix Costs at L2



WBS		Base (M$)	Cont.(%)
5.	FPix	4.65	65
5.1	Electron.	2.41	62
5.2	Sensors	.79	58
5.3	Mechanics	.63	69
5.4	Assembly	.64	72
5.5	Test	.17	93

FPix Costs at L3



- Readout Chip
- Port Card
- Interconnects
- VME Electronics
- Power Supplies
- Cables
- Monitoring
- Sensor R&D
- Sensor Prototy.
- Sensor Product.
- Mechanical
- Cooling
- Bump Bonding
- Assembly

Cost Drivers:

Readout Chip

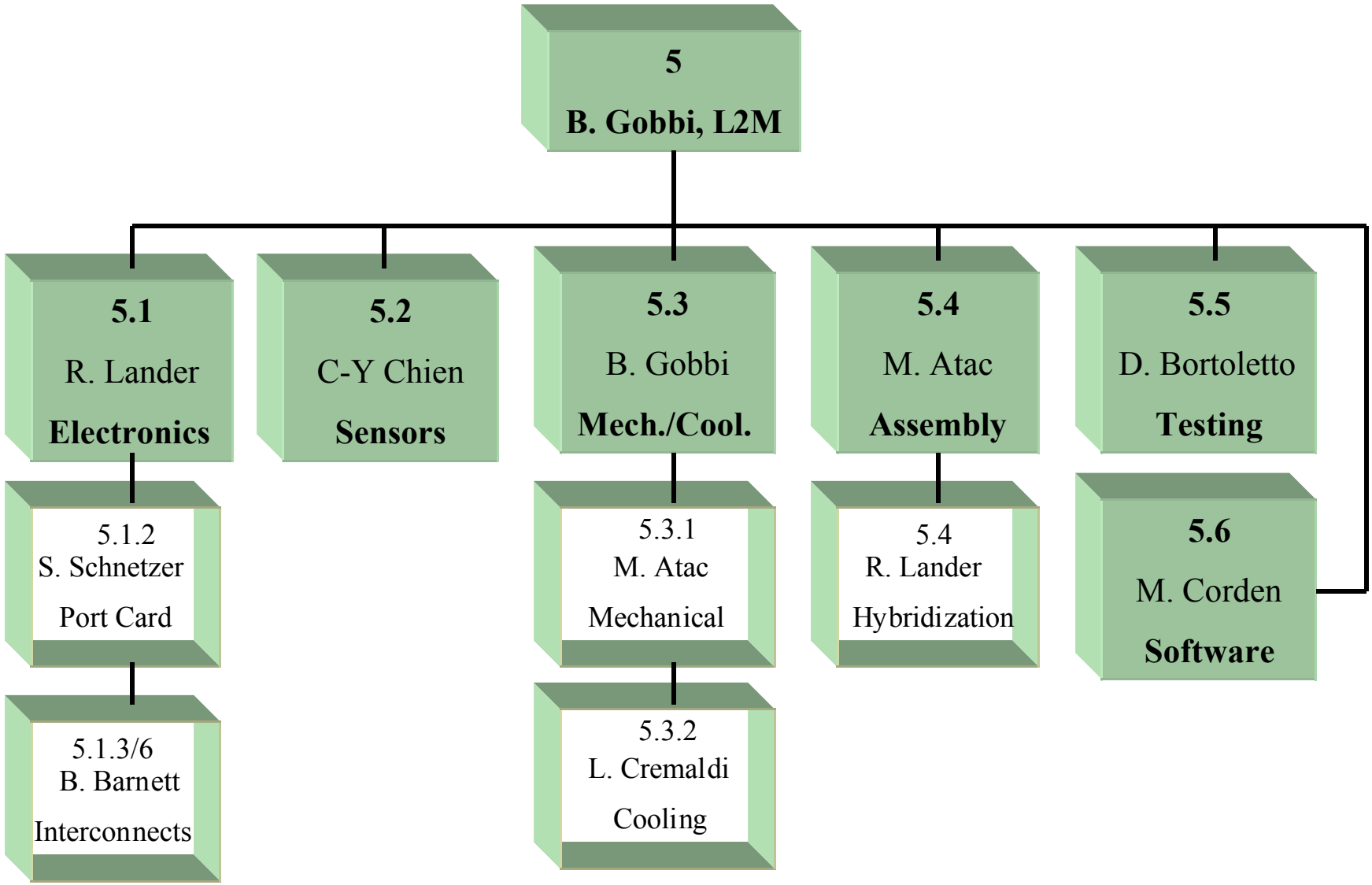
Port Card

Sensors

Mechanics

Bump Bonding

Organization L2, L3



Organization L2, L3. cont.

Communications:

- **Monthly Meeting**
  - video-conference:
    - FNAL, JHU, Purdue, Rutgers, SCRI, UC D
  - audio-conference:
    - UMiss., Texas Tech

DATE / AGENDA	DAY OF WEEK
January 14	Wednesday
February 24	Tuesday
April 22	Wednesday
May 26	Tuesday
June 30	Tuesday
[illegible]	Wednesday
[illegible]	Wednesday
[illegible]	Tuesday
[illegible]	Tuesday
November 24	Tuesday
December 15	Tuesday

- **Web Sites**
  - CERN CMS, FNAL CMS,
  - NU, Purdue, Rutgers, SCRI, UC Davis, U Miss.
- **e-mail, Tel, Fax, ...**
- **Attend Meetings**: CMS Week, TK Week

Status and Progress

5.1 Electronics: Test cell of readout chip, rad. hard version.
First design of Port Card (5.1.2) and HDI (5.1.4)

5.2 Sensors: Results from first submission, second in progress

5.3.1 Mechanics: Refine design, prototype U-tubes, panels

5.3.2 Cooling: Measure ΔT over panel, ΔP of U-tubes

5.6 Simulations: 150μm pixels, turbine blade geometry, include material, calculate resolution and rates

TDR: Submitted April 15th

Status: Goals well defined. Great progress. On schedule.

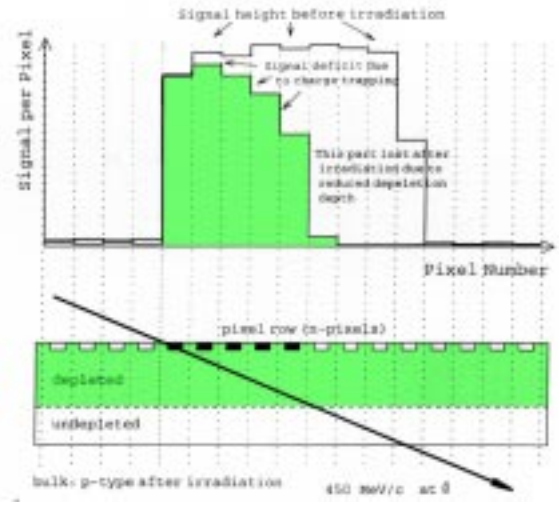
Sensor Studies at PSI

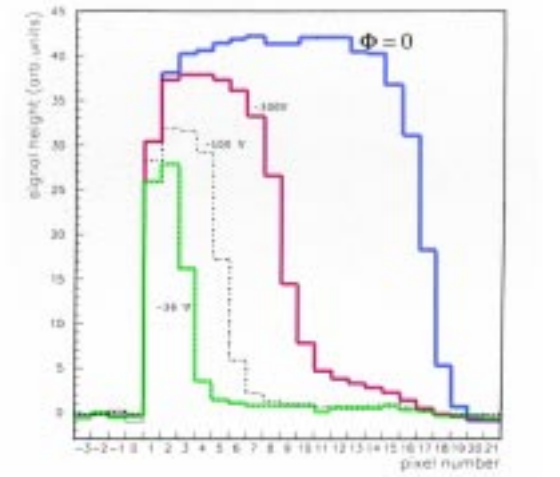
300μm sensor irradiated with 450MeV/c π^+ to

$3\times10^{14}/cm^2$ $6\times10^{14}/cm^2$ $9\times10^{14}/cm^2$

= 6 Yrs of LHC @ R=7.5cm

Date	Flux Φ	Depletion	Q collected
Oct 1996	**Φ = 0**	**300μm**	**~20,000e⁻**
	$6\times10^{14}/cm^2$	**135μm**	**~ 9,700e⁻**
	Sensors stored at +2.5°C		
Nov 1996		**140μm**	**~10,000e⁻**
May 1997		**160μm**	**~11,400e⁻**
Nov 1997		**190μm**	**~13,570e⁻**

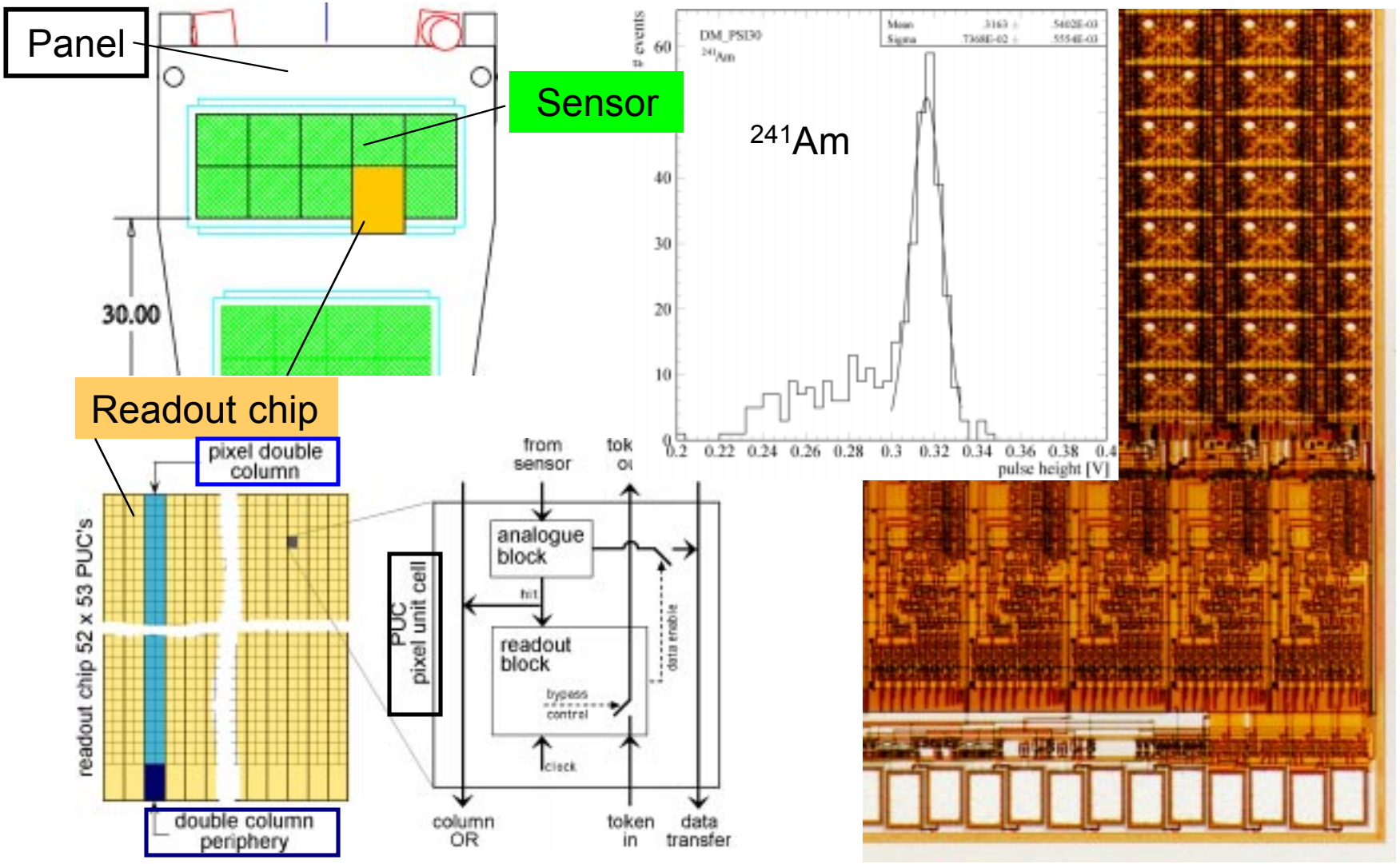




Beneficial annealing

electronics noise: 500e⁻ , threshold: 2500e⁻

Readout Chip. PSI, UCD



Scope & Contingency Since Last Review

- The FPix subsystem has been reviewed by the FNAL PMG in a full bottom up cost estimate.
- Contingency was assessed at the lowest WBS task level using the US CMS methodology.
- Contingency was increased over the last review by 21% to 65%, (2.2M$ $\rightarrow$3.0M$).
- The base cost was reduced by .6M$ by using the same readout chip for Barrel and FPix.
- More funds (.5M$) were assigned to FPix.

WBS, Milestones, and Schedule

- A fully resource loaded schedule has been provided containing 750 tasks.

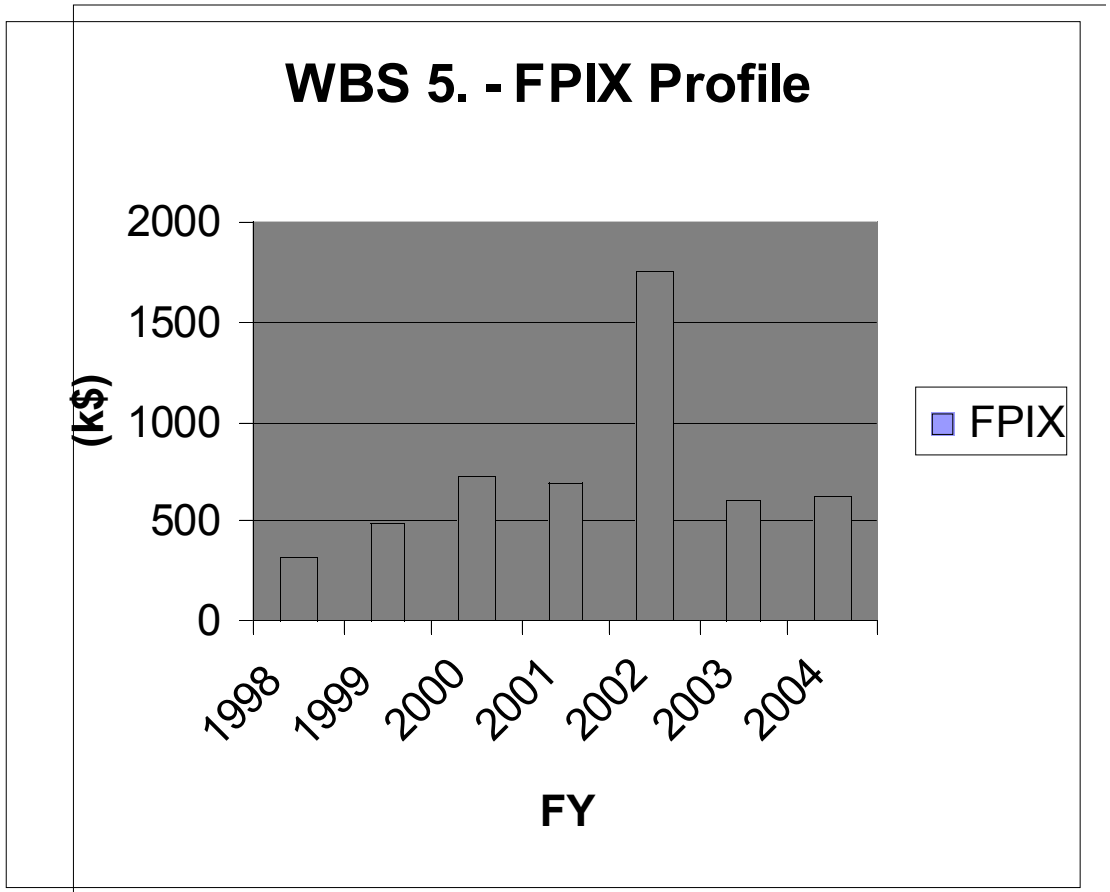
- A WBS dictionary (of 50 pages) and basis of estimate has been produced, along with resource tables.

WBS, Milestones, and Schedule

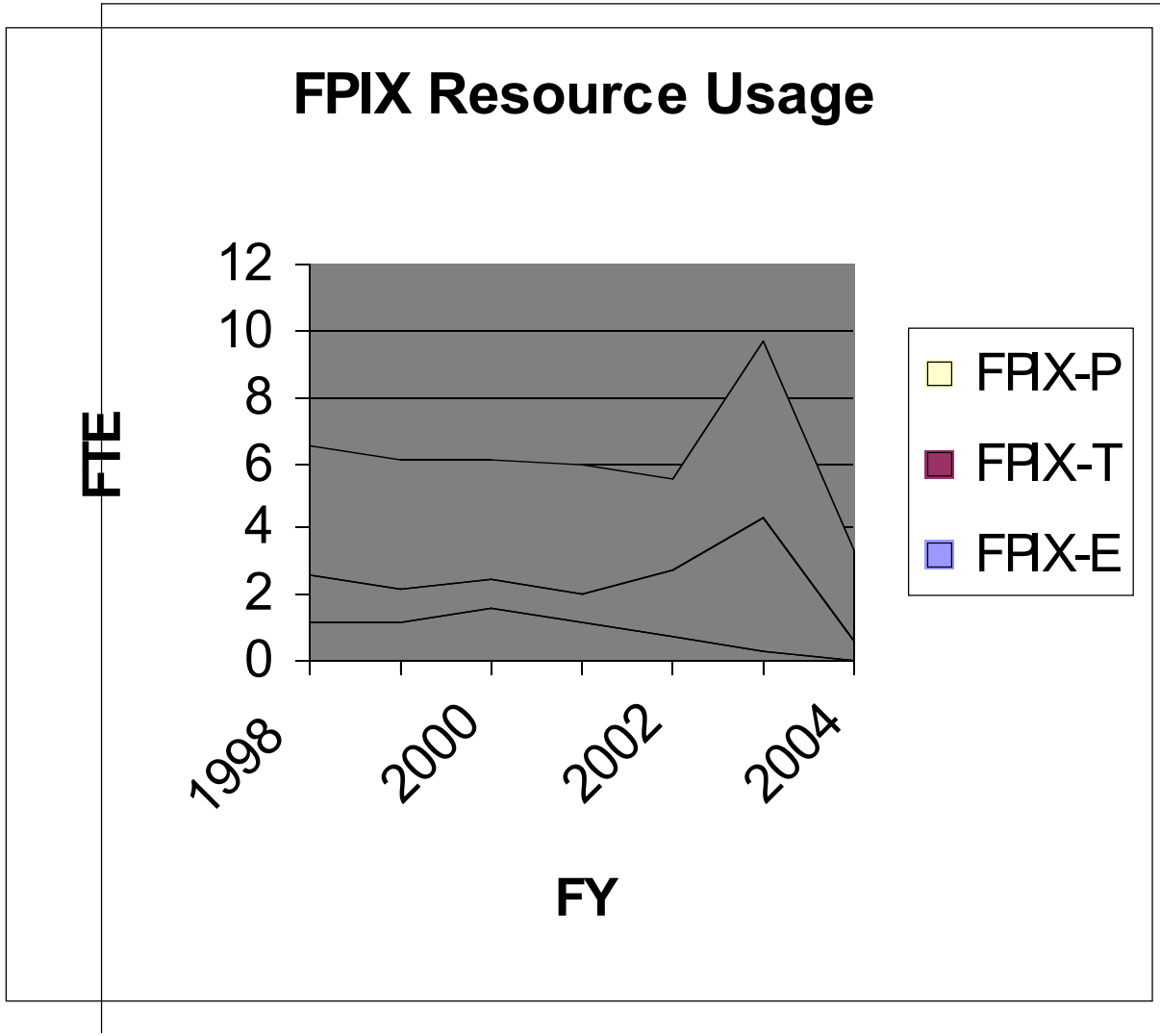
Port Card

Commitment and Resource Profiles

The obligation profile is derived from the MS PROJECT resource loaded schedule.

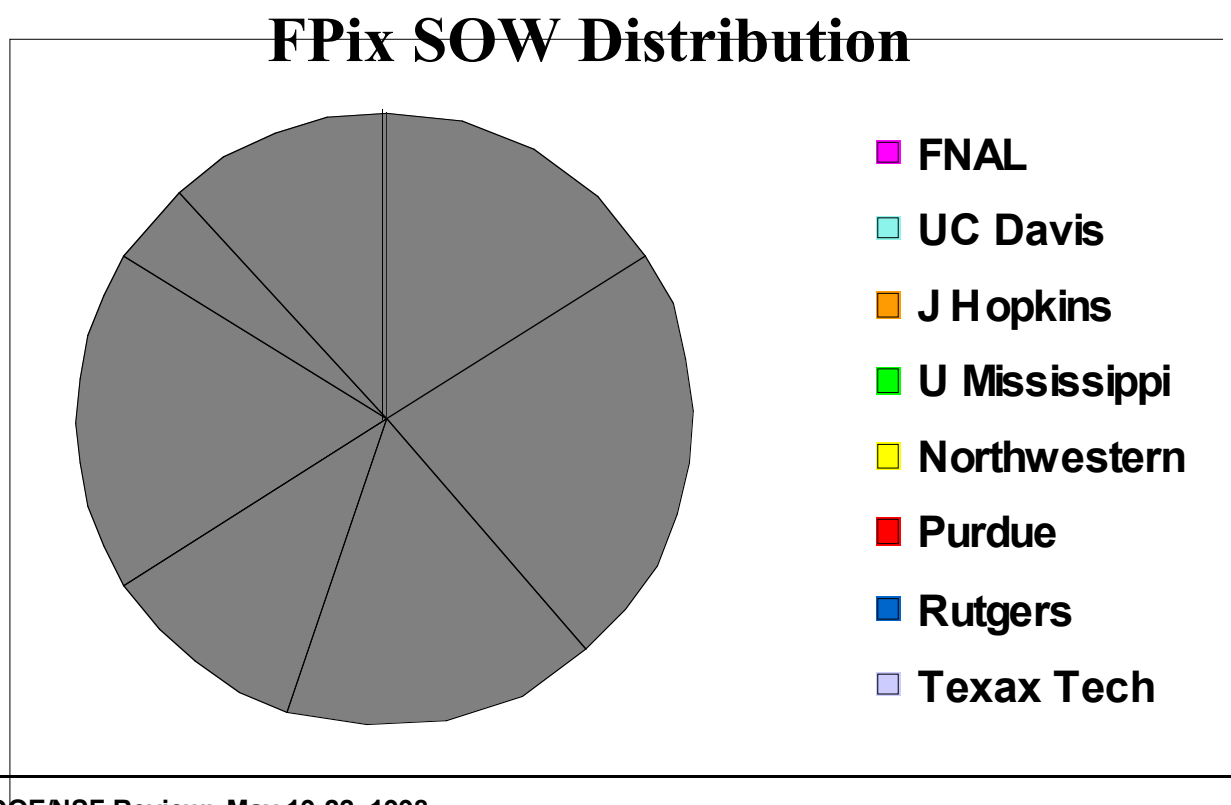


FPIX Resource Usage



Statements of Work

A SOW is in place for FY98 with all FPix institutions which are currently active. MOUs with participating institutions for the full project will be drafted ASAP after US CMS is baselined.



Committee Concerns and Corrective Actions

Develop: (a) a 2-year R&D plan, … and (b) for the production of 4 disks, ...(c) A credible, ground up cost estimate, and funding profiles ....

A MS PROJECT for the FPix was developed: bottom up resource loaded cost estimates, with contingencies, schedule and milestones.

Plan for a Technical Design Report.

A TDR has been submitted (April 15) by the CMS Tracking Group. Approved (?) in July.

Committee Concerns and Corrective Actions

Seek mechanical engineering support.

Additional mechanical engineering support was added by consulting with engineers at Fermilab. For the moment this has been sufficient.

Work towards common solutions with European collaborators.

Our collaboration with the Europeans has continued to increase. It was decided to use the same readout chip for Barrel and FPix.

Meeting on May 26 with PSI, BTeV and Atlas to explore collaboration on sensors.

Summary and conclusions

- The concerns raised by the Committee have been addressed.
- A fully resource loaded schedule has been made.
- The cost estimate and the WBS has been completely redone.
- The contingency has been raised by 21% to 65% which is consistent with recent HEP experience.
- The physics capability has been maintained.

Technical Design Report

Front Page TDR